IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Michael Charles LACROIX

Application No.: 10/017,232

Filing Date: December 13, 2001

For: LINEAR ELECTRIC MOTOR CONTROLLER AND SYSTEM FOR PROVIDING LINEAR CONTROL

Confirmation No.: 1610

Patent No.: 7,265,516 B2

Patent Date: September 4, 2007

Attorney Docket No.: 104427-100

<u>REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 C.F.R. § 1.322</u>

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Patentees hereby respectfully request the issuance of a Certificate of Correction in connection with the above-identified patent. The corrections are listed on the attached Form PTO-1050. The corrections requested are as follows:

At column 3, line 20, after "electric", change "moter," to -- motor, --. Support for this change appears on page 3 of the specification as amended on January 13, 2006.

At column 18, line 5, after "monitor the voltage across said motor and", delete "a". Support for this change appears in application claim 18 as amended on April 13, 2007.

The requested corrections are for errors that appear to have been made by the Office. Therefore, no fee is believed to be due for this request. Should any fees be required, however, please charge such fees to Winston & Strawn LLP Deposit Account No. 50-1814. Please issue a Certificate of Correction in due course.

A fee of $100 is believed to be due for this request. Please charge the required fees to Winston & Strawn LLP Deposit Account No. 50-1814. Please issue a Certificate of Correction in due course.

Respectfully submitted,

10/17/07
Date

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212-294-3311

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,265,516 B2
APPLICATION NO.: 10/017,232
DATED: : Sep. 4, 2007
INVENTOR(S) : LaCroix

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 3:
Line 20, after "electric", change "moter," to -- motor, --.

Column 18:
Line 5, after "monitor the voltage across said motor and", delete "a".

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machine, in which the state machine sets the voltage supplied to an electric motor. It can also include a closed loop feedback for generating a signal indicating the voltage across the electric motor, which can then be used for comparison to the voltage set by the state machine.

In another embodiment, the invention includes a system incorporating at least the above-described automotive electric motor linear speed control. In another embodiment, the invention includes a system for controlling the speed of an automotive electric motor, in which the voltage across the electric motor determines the speed of the electric motor. This system can include a digital to analog converter means for converting a digital signal to analog voltage for setting voltage across the electric motor, a microprocessor and associated digital memory for generating the digital signal, where the microprocessor is configured to instantiate and operate a digital state machine for converting the duty cycle of an input signal to the microprocessor and associated digital memory for setting the voltage supplied to the motor, electric moter, and a closed loop feedback loop means for monitoring the voltage across the motor and generating a signal for input to the microprocessor. The invention also relates to an automobile including the above-described system. In a preferred embodiment, the system includes a temperature-control system.

In one preferred embodiment, the invention relates to a linear speed control for an automotive electric motor that includes a digital state machine for converting the duty cycle of an input signal generated by an associated closed loop feedback, an over-current sense circuit for monitoring the current across said electric motor, an over/under voltage sense circuit for monitoring a supply voltage to the electric controller, a digital to analog converter for converting an 8-bit digital signal to analog voltage for setting voltage across said electric motor, and a closed loop feedback loop for monitoring the voltage across said motor and generating a feedback signal for adjusting the voltage supplied to the motor.

The controller can also be packaged inside a controller module for ease of assembly into a final product, such as an automobile. Thus, the invention also relates to an electronic controller module including an electronic controller that generates at least about 15 W of heat, an enclosure made of at least one heat-resistant material configured and dimensioned to substantially surround and physically protect the controller, at least one electrically-conductive member to provide input or output of at least one electrical signal through the enclosure to the controller, and a heat sink operatively associated with the controller to receive heat therefrom, the heat sink being configured and dimensioned to dissipate a sufficient amount of heat to inhibit or avoid damage to the controller and enclosure.

In one embodiment, the enclosure includes a lid which comprises the heat sink. In a preferred embodiment, the lid is made of a heat-resistant material and the heat sink includes a heat fin assembly mounted upon the lid that extends away therefrom. A portion of the heat sink can extend through the lid to a position adjacent the controller to facilitate heat dissipation. In one embodiment, the heat sink is made of a material that dissipates about 20 W to 150 W. The heat sink material can include any suitable thermally conductive material, including aluminum, copper, thermally conductive plastic(s), or a combination thereof. The heat-resistant material does not melt on exposure to about 150 W and typically includes an olefinic polymer, preferably one that includes amide units. In a preferred embodiment, the olefinic polymer includes a polyamide-polypropylene copolymer and includes a filler in an amount sufficient to increase the heat-resistance thereof. Preferably, the filler includes talc, glass, ceramic, mica, silicate, clay, aramid, lithopone, silicon carbide, diatomaceous earth, carbonates, metal or an alloy or oxide thereof, particulate carbonaceous material, hard particulate material, or combinations thereof. The filler can be present in any form, preferably whiskers, fibers, strands, or hollow or solid micro spheres.

In a preferred embodiment, the electronic controller is a linear controller capable of facilitating temperature control in an environment. Preferably, the enclosure is at least substantially rectangular. For example, the enclosure can have dimensions of about 3 cm to 8 cm in length, about 1 cm to 4 cm in height, and about 3 cm to 6 cm in width. As another example, the heat sink includes at least two short fins having a length of about 0.25 cm to 1 cm and at least two long fins having a length of about 1.5 cm to 6 cm, each adjacent the enclosure at one end thereof and extending away therefrom. Preferably, the at least two long fins include a first heat fin having a length of about 1.75 cm to 2.25 cm and a second heat fin having a length of about 3.5 cm to 4.5 cm.

In one embodiment, the lid and the enclosure are operatively associated via a plurality of projections and gaps to permit the lid to securely snap into place against the enclosure so as to collectively completely surround the electrical controller. In a preferred embodiment, the module further includes an insulating member between the controller and the lid and in contact therewith to inhibit or avoid thermal degradation of the controller. Preferably, the insulating member can include at least one silicone material that is sufficiently flexible to at least partially conform to the controller. In another preferred embodiment, a thermal grout is included in the module and is disposed to facilitate the lid and the heat-resistant material being at least water-resistant.

In one preferred embodiment, the controller includes a single circuit board having all controller components mounted thereon that is surrounded by the enclosure and the lid.

The invention also relates to a method for dissipating heat from an electronic controller by providing an enclosure around the electronic controller which generates at least about 15 W of heat during operation, associating a heat sink with the controller to receive heat therefrom, and dissipating a sufficient amount of heat to inhibit or avoid damage to the controller and enclosure. In one embodiment, the controller generates at least about 20 W to 150 W during operation. In another embodiment, at least about 90 percent of the heat generated is dissipated via the heat sink.

BRIEF DESCRIPTION OF DRAWINGS

The purpose and advantages of the present invention will be set forth in and apparent from the description that follows, as well as by practice of the invention. Additional advantages of the invention will be realized and attained by the methods and systems particularly pointed out in the written description and claims hereof, as well as from the appended drawings, wherein

FIG. **1** is a block diagram of a linear controller integrated circuit in accordance with a preferred embodiment of the current invention;

FIG. **2** is a finite state machine diagram of controller logic used in a preferred embodiment of the current invention;

FIG. **3** is a block diagram depicting the pinouts associated with the controller integrated circuit of an embodiment of the current invention;

a digital state machine for converting the duty cycle of an input signal for setting the voltage to be supplied to the motor, wherein the duty cycle is provided to the digital state machine by digital circuitry that receives the input signal in pulse-width modulated form in accordance with the duty cycle;

an over-current sense circuit, for monitoring the current across said electric motor;

an over/under voltage sense circuit, for monitoring a supply voltage to the electric controller;

a digital to analog converter, for converting an 8-bit digital signal to analog voltage for setting voltage across said electric motor; and

a closed loop feedback loop adapted and configured to monitor the voltage across said motor and generate a feedback signal for adjusting the voltage supplied to the motor.

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